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[54] **3-DIMENSIONAL IMAGE ROTATION METHOD AND APPARATUS FOR PRODUCING IMAGE MOSAICS**

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[*] Notice: This patent is subject to a terminal disclaimer.

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[52] **U.S. Cl.** **382/284**; 345/435; 345/437; 348/36; 382/296

[58] **Field of Search** 382/154, 284, 382/294, 296, 282; 345/419, 425–438; 348/42, 263, 580, 36, 37

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[57] **ABSTRACT**

The invention aligns a set of plural images to construct a mosaic image. At least different pairs of the images overlap partially (or fully), and typically are images captured by a camera looking at the same scene but oriented at different angles from approximately the same location or similar locations. In order to align one of the images with another one of the images, the following steps are carried out: (a) determining a difference error between the one image and the other image; (b) computing an incremental rotation of the one image relative to a 3-dimensional coordinate system through an incremental angle which tends to reduce the difference error; and (c) rotating the one image in accordance with the incremental rotation to produce an incrementally warped version of the one image. As long as the difference error remains significant, the method continues by re-performing the foregoing determining, computing and rotating steps but this time with the incrementally warped version of the one image.

41 Claims, 25 Drawing Sheets

(4 of 25 Drawing Sheet(s) Filed in Color)